

REMARKS

The present invention relates to an adaptive antenna-matching network for wireless communications devices. Conventional antenna tuning units (ATU) typically initiate an antenna tuning procedure only after a change in operating frequency. During the tuning phase, the ATU searches for the lowest Voltage Standing Wave Ratio (VSWR), and tunes the antenna to the transmitter accordingly. However, once tuned, conventional ATUs will not re-tune the antenna to the transmitter until the next change in frequency. Thus, conventional ATUs do not consider impedance mismatches that may occur between the antenna and the transmitter while the transmitter operates at the selected frequency. The present invention solves this problem with a low-cost adaptive antenna-matching network that quasi-continuously re-tunes the antenna to the transmitter while the transmitter is operating at the selected frequency.

The Examiner has maintained the rejection to claim 34 under 35 U.S.C. § 102(b) as being anticipated by Sroka. Applicant respectfully disagrees. Claim 34 requires "an impedance mismatch measuring and quantizing unit ...measuring forward and reflected power of a signal transmitted on the selected transmit frequency band, and generating mismatch indication signals providing a quantized indication of antenna impedance mismatch, the impedance mismatch measuring and quantizing unit generating the mismatch indication signals during the transmit time slot of the TDMA frame period." Sroka does not teach these elements of claim 34, and thus, necessarily fails to anticipate claim 34 under § 102.

First, the Examiner asserts that the adaptation unit of Sroka measures and generates mismatch indication signals "during the transmit time slot of the TDMA frame period," and cites col. 6, ll. 1-7 of Sroka for support. However, this passage does not teach what the Examiner believes it to teach. For reference, the cited passage appears below.

In order to effect the adaptation algorithm, a signal is transmitted resulting in the forward path signal strength being measured and compared with the return path signal strength. A low output power would be desirable so as to not reduce the battery life significantly or effect the adaptation algorithm during transmission. Preferably measurement of the signal strength takes place during transmission

as is the case for an analogue system. Measurement could, however, be effected in the 'dead time' before transmission.

*Sroka*, col. 5, ln. 66 – col. 6, ln. 7. While this passage does disclose that the adaptation unit measures a forward strength of a transmitted signal, it does not teach that measurements occur during a transmit time slot. In actuality, the transmitter of *Sroka* is activated during a period of the TDMA frame other than the transmit time slot. One indication of this fact is the mention of the *low output power* of the signal being measured. *Sroka* discloses that this saves battery power, but it also avoids interfering with other mobile terminals that are transmitting/receiving on their own time slots. Besides, if the measurements of *Sroka* did occur during a transmit time slot as the Examiner suggests, *Sroka* would teach transmitting the signal at whatever the current power level happened to be rather than explicitly stating that a low power is desirable. Indeed, low power, no matter how desirable, may not be sufficient with which to communicate with a base station.

Another indication is *Sroka*'s explicit mention that the "adaptations are made during idle periods, so that impedance values which result in a mismatch being made worse will not actually affect transmission characteristics." *Sroka*, col. 5, ll. 40-45. In other words, *Sroka* discloses a trial-and-error method of determining how to adapt the antenna. *Sroka*, col. 6, line 37 - col. 7, line 22. This method is not always accurate and, in fact, may make matters worse. *Sroka*, col. 6, ll. 36-39. If the disclosed method were to occur during the transmit time slot as the Examiner theorizes, *Sroka* could end up with an even worse impedance mismatch, which when used, would undoubtedly impede the ability to communicate during the transmit time slot. The only way in which *Sroka* can avoid this undesirable side effect is to activate the transmitter, measure the antenna mismatch, and perform trial and error adaptation outside the allocated transmit time slot. This way, if the mismatch were made worse, the impedance value need not be used, and the mobile terminal could obtain a corrected impedance value before the next transmission time slot. See *Sroka*, col. 7, ll. 7-21.

Second, claim 34 requires “the impedance mismatch measuring and quantizing unit [to generate] . . . mismatch indication signals.” The mismatch indication signals required by claim 34 provide a coarse indication in which to adjust the antenna. That is, not only do the requisite indication signals provide a match/no-match indication, but also, they indicate in which direction to make adjustments. The trial-and-error method of Sroka, in contrast, provides a scalar quantity that reflects only the value of the forward and reflected powers. That is, the impedance value of Sroka only indicates whether the antenna is sufficiently tuned or not. However, this value does not reflect a reflection coefficient phase, and thus, gives no indication regarding how to correct the mismatch. Because of the lack of the reflection coefficient phase, the device of Sroka has no clue in which direction to make a matching adjustment. Thus, Sroka must employ a trial-and-error method, and performs adaptations based on values “best-so-far” values identified over time. See *Sroka*, col. 7, ll. 7-21.

Simply put, Sroka fails to teach the requisite mismatch indication signals, and fails to teach that the adaptation unit performs signal measurements and adaptation based on a mismatch indication during the allocated transmission time slot. In stark contrast, any adaptations in Sroka are “best guess,” and occur outside of the allocated transmit time slot so they do not impede transmission. As such, Sroka cannot anticipate claim 34 under § 102, and thus, Applicant respectfully requests the allowance of claim 34 and its dependent claims 35-40.

The Examiner also maintained the rejection of claim 41 under 35 U.S.C. § 102(b) as being anticipated by Sroka. However, claim 41 requires “measuring a signal to determine a complex reflection coefficient indicative of a quality of an impedance match between a transceiver and an antenna at a selected frequency band.” As stated above, the requisite complex reflection coefficient provides a match/no-match indication and an indication as to the direction of the adjustment. In other words, Applicant’s invention requires knowledge of where to adjust to prior to making an adjustment. Sroka, in contrast, teaches measuring the forward and reflected power to calculate a scalar quantity. This value, however, only indicates whether

the antenna is sufficiently tuned or not. It does not give any indication regarding where to adjust the antenna to correct the mismatch. The Examiner cites column 5 of Sroka, lines 20-23, in an attempt to show that Sroka provides the requisite information. However, all this passage reveals is that modifications to the reactance circuits may be represented on a Smith chart. It says nothing about the information used by Sroka to perform adaptations. Besides, because Sroka discloses a trial-and-error method, any modification to the reactance circuits could only be plotted after the adjustment is made and verified. Thus, Sroka also fails to anticipate claim 41 under 35 U.S.C. § 102(b). Accordingly, Applicant respectfully requests the allowance of claim 41, and its dependent claims 42-51.

The Examiner also maintained the rejection of claim 52 under 35 U.S.C. § 102(b) as being anticipated by Sroka. Claim 52 requires “generating an impedance mismatch signal to a controller during the transmit time slot of the TDMA frame based on the quantized forward power and reflected power.” Thus, for the reasons stated above with respect to claim 34, Sroka fails to anticipate claim 52. Applicant therefore respectfully requests the allowance of claim 52, and its dependent claims 53-62.

The Examiner also maintained the rejection of claim 63 under 35 U.S.C. § 102(b) as being anticipated by Sroka. Claim 63 requires the controller of the impedance optimization circuit to “detect an impedance mismatch between the transceiver and the antenna at the selected frequency band, said impedance mismatch comprising an impedance mismatch signal generated during a transmit time slot of the TDMA frame and based on the quantized forward power and reflected power.” Thus, for the reasons stated above with respect to claim 34, the patent to Sroka fails to anticipate claim 63 under § 102(b). Accordingly, Applicant respectfully requests the allowance of claim 63.

The Examiner has also maintained the rejection of claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Sroka in view of Wright. Claim 1 requires, “an adjustable matching network selectively connecting the antenna to a select one of a third plurality of transmit power

amplifiers corresponding to the first plurality of transmit frequency bands for signal transmission, the adjustable matching network matching an impedance of the antenna to the select one transmit power amplifier.” Sroka adaptively re-tunes an antenna using a trial-and-error method. Wright, on the other hand, compensates for impedance mismatches by controlling the output power of the power amplifier. Indeed, retuning an antenna necessarily negates the need for compensation induced by controlling the power output of the power amplifier.

The Examiner has simply theorized that Sroka may be combined with Wright merely because Wright discloses a plurality of amplifiers. However, this reasoning constitutes a *legally improper* § 103 analysis. Simply because two references taken alone may show all the elements of a claim is not now, and has never been, a *legally sufficient* reason combine. The patent to Sroka never indicates anything regarding a desire to control the power output of a power amplifier. The patent to Wright never indicates a desire to adaptively tune an antenna instead of/along with controlling the power output of the amplifier. More importantly, there is no need to compensate for power if the antenna is properly tuned. As such, it appears as though the Examiner’s proffered motivation is unsupported by the cited references, and could only have come from Applicant’s own invention through impermissible hindsight reconstruction. Accordingly, neither Sroka nor Wright teach or suggest, alone or in combination, claim 1.

Therefore, Applicant respectfully requests the allowance of claim 1, and its dependent claims 2-33.

Respectfully submitted,  
COATS & BENNETT P.L.L.C.

A handwritten signature in black ink, appearing to read "Stephen A. Herrera", is written over a horizontal line.

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Stephen A. Herrera  
Registration No.: 47,642

P.O. Box 5  
Raleigh, NC 27602  
Telephone: (919) 854-1844